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A short biography of Luis Fariñas del Cerro

Pedro Cabalar[a], Martín Diéguez[b], Andreas Herzig[c] and David Pearce[d]

[a]Computer Science Department, University of Corunna, Corunna, Spain; [b]Lab-STICC, CERV, ENIB, Brest, France; [c]IRIT, CNRS, University of Toulouse, Toulouse, France; [d]Department of Computer Science, Universidad Politécnica de Madrid, Madrid, Spain

ABSTRACT

Near the end of 2015, Luis Fariñas del Cerro officially retired as directeur de recherche in the Centre National de Recherche Scientifique (CNRS) and became an Emeritus researcher of the CNRS. The present special issue is a Festschrift in his honour to celebrate Luis's achievements in science, both as an outstanding scholar as well as a remarkable and highly successful organiser, administrator and leader in science and technology policy and management, in particular as the founder of the Journal of Applied Non-Classical Logics. The issue contains 13 scientific contributions by 32 authors, among them Luis's colleagues, former students and friends. Preceding versions of these papers were presented at the international workshop 'Logical Reasoning and Computation' that was held at IRITInstitut de Recherche en Informatique de Toulouse, Université Paul Sabatier, Toulouse, on 3–4 March 2016. The present introduction contains a short scientific biography describing the many different areas of logic and computation where Luis contributed significant advances.

KEYWORD

Non-classical logics

1. A short bio

Luis Fariñas studied at the Universidad Complutense de Madrid, where he obtained a *Licenciatura* in mathematics in 1972, and later a doctorate in mathematics in 1982. Meanwhile, in 1977, he joined the *Laboratoire d'Informatique pour les Sciences de l'Homme* of the *Centre National de Recherche Scientifique* (CNRS) as a CNRS researcher. In this lab, based in Marseille and headed by Mario Borillo, he prepared his PhD under the supervision of Maurice Nivat at *Université Paris VII* (Fariñas del Cerro, 1981). By the time he defended his thesis, 'Déduction automatique et logique modale', in 1981, he and part of the Marseille lab had just moved to Toulouse (1980). The small group soon became part of the *Langages et Systèmes Informatiques* lab (1982) where Luis defended his habilitation in 1985.

1.1. His leadership, the key for the success of IRIT

The lab was merged in 1989 with three other Toulouse labs becoming the ***Institut de Recherche en Informatique de Toulouse*** (IRIT). Luis had already served as the head of its

CONTACT Andreas Herzig herzig@irit.fr

scientific board for a couple of years when he became IRIT's director in 1999. During the 12 years of his reign (which ended in 2011), he restructured the lab in depth and succeeded in greatly improving its organisation and research output. He managed to bundle the 20+ teams into 7 themes and to enlarge IRIT's patronages to all public universities of Toulouse. His success was confirmed by the top 'A+' mark that was given to IRIT in 2010 by national evaluation agency AERES.

Beyond IRIT, Luis was in charge of the scientific strategy of ***Université Toulouse III Paul Sabatier*** (UPS, 2008–2012), which hosts the main part of IRIT. He was a driving force in the construction of the *Université de Toulouse* (now *Université Fédérale de Toulouse-Midi-Pyrénées*) which federates the public universities of the region and of which he was elected president of the senate in 2012.

1.2. An exceptional career

Recruited as *chargé de recherche*, he became *directeur de recherche* in 1991 and was subsequently promoted to *première classe* and *classe exceptionnelle*. He served as *directeur adjoint* of the newly created CNRS department *Sciences et Technologies de l'Information et de la Communication* where he was in charge of international relations (2001–2004) and took up service recently as *directeur adjoint scientifique* at the *Institut des Sciences de l'Information et de leurs Interactions* in 2015.

During his career, Luis founded the Applied Logic Group, which merged with the '*Langue, Raisonnement, Calcul*' group in 2000. The group grew rapidly in size and produced an important number of PhD theses that are discussed below. Andreas Herzig was recruited as a *chargé de recherche* CNRS in 1990 (*directeur de recherche* since 2004) and Philippe Balbiani in 1991 (*directeur de recherche* since 2007). Olivier Gasquet obtained a *maître de conférences* position at UPS in 1994 (professor since 2005) and Dominique Longin a *chargé de recherche* CNRS position in 2000. When Luis became director of IRIT, the LILaC group was first headed by Andreas Herzig (2000-2004) and then by Philippe Balbiani (2004–2015). It is now led by Dominique Longin and Emiliano Lorini.

In 1990, Luis founded the Journal of Applied Non-Classical Logics (JANCL) and acted as its Editor-in-Chief until 2014. The JANCL is a major forum for publications covering all aspects of non-classical logic that is well-established in the fields of philosophical logic, mathematical logic, theoretical computer science and artificial intelligence. Since its creation, JANCL was a protagonist in the domain of non-classical logics, promoting the spreading of novel approaches and their application.

Luis was involved in numerous projects at the national and European levels, including the ESPRIT Basic Research Actions 'Mechanising Deduction in Logics of Practical Reasoning' and 'Defeasible Reasoning and Uncertainty Management'. He also set up the *Laboratoire Européen Associé* 'French-Spanish Laboratory for Advanced Studies in Information, Representation and Processing' with *Universidad Politécnica de Madrid*. Luis was elected a member of the *Académie des Sciences Inscriptions et Belles Lettres de Toulouse* in 2014. His international reputation was confirmed by his election as an EurAI[1] Fellow in 2005.

2. Luis's research interests

Luis's work covers many areas of logic, centered around non-classical logics. In the sequel, we will discuss the most important topics.

2.1. Proof methods and computability of non-classical logics

Everything started with Luis's PhD thesis, where he was the first to extend the resolution method to modal logics. This theme was continued in several publications with Patrice Enjalbert, as well as in the PhD thesis of Marta Cialdea (now professor at *Università degli Studi Roma Tre*) on the Herbrand property for modal logics (Cialdea, 1986), and Andreas Herzig's and Olivier Gasquet's PhD theses on the translation into first-order logic (Herzig, 1989; Gasquet, 1994). By the end of the 1990s and together with Olivier Gasquet and Andreas Herzig, he returned to a more traditional proof method for modal logics and started an in-depth investigation of the tableaux method. The result was a very general definition of tableaux procedure based on graph rewriting, ultimately leading to the implemented tableaux theorem proving platform LoTREC[2] and to a tableaux-based introductory book to modal logics (Gasquet, Herzig, Said, & Schwarzentruber, 2014).

Further work of Luis included the study of paraconsistency, in the framework of the PhD of Mamede Lima Marques (now professor at *Universidade de Brasilia*) (Lima Marques, 1992) and in collaboration with Walter Carnielli from the *Unversidade de Campinas*, Brazil.

Moreover, the proof theory of Epstein's dependence logic was investigated in the PhD thesis of Valérie Lugardon (Lugardon, 1996).

In this issue, Philippe Balbiani and Çiğdem Gencer's paper *KD and KT are Nullary* can be classified within this line of research. More precisely, it considers the topic of unification in a modal context. Antonio Frías Delgado investigates the domain of first-order modal logic in his contribution *A note on Barcan Formula* while Ivo Düntsch, Ewa Orlowska and Tinko Tinchev explore modal logic and its connections with the algebraic theory in *Mixed algebras and their logics*.

2.2. Logic programming

During his years in Marseille, Luis interacted with Alain Colmerauer and his group who at that time were developing logic programming and PROLOG. This inspired Luis to investigate extensions of logic programming languages by modal operators. This led to the metaprogramming framework MOLOG, whose implementation TARSKI was carried out during the doctoral research of Jean-Marc Alliot (now professor at IRIT) (Alliot, 1992).

Luis began an in-depth logical investigation of the notion of negation-as-failure while supervising Philippe Balbiani's PhD thesis (Balbiani, 1991), using an approach based on the Gödel-Löb provability logic.

Recently, Luis returned to the logical foundations of logic programming, more specifically Answer Set Programming (ASP): during the PhD work of Ezgi Iraz Su, he investigated the modal logic behind equilibrium logic as well as modal extensions of ASP (Su, 2015). Further research was done with his colleagues from Spain, Pedro Cabalar, David Pearce and Agustín Valverde (Fariñas del Cerro, Pearce, & Valverde, 2013; Cabalar, Fariñas del Cerro, Pearce, & Valverde, 2014).

In the 1990s, Luis obtained several results on modal logic programming together with his Finnish colleague Martti Penttonen (Fariñas del Cerro and Penttonen, 1987; Fariñas del Cerro and Penttonen, 1991/1992). A byproduct of this line of work was a general method of producing undecidable modal logics ('grammar logics') (Fariñas del Cerro and Penttonen, 1988).

Regarding this special issue, the papers *Stable reasoning* by Pedro Cabalar, David Pearce and Agustín Valverde and *Temporal Equilibrium Logic with Past Operators* authored by Felicidad Aguado et al. belong to this line of research.

2.3. Non-monotonic reasoning, conditional logics, belief revision

The work on negation-as-failure in logic programming opened a research avenue towards non-monotonic reasoning mechanisms. Luis's approach was based on conditional logics. While standard modal logics have unary modal operators, conditional logics have binary modal operators relating two formulas (an antecedent and a consequent), whence the relation to non-monotonic consequence relations.

The PhD thesis of Philippe Lamarre (now professor at *Institut National des Sciences Appliquées* in Lyon) provided an embedding of the main existing conditional logics into standard modal logics, a result that was unexpected at the time (Lamarre, 1992).

The PhD thesis of Gabriella Crocco (now professor in the philosophy department of *Aix-Marseille Université*) contributed a thorough proof-theoretical analysis of conditional logics and their non-monotonic reasoning principles (Crocco, 1993). This also led to the publication of an edited volume (Crocco, Fariñas del Cerro, & Herzig, 1995) that became a standard reference in the field.

During these years, Luis joined a group of French researchers conducting a comparative evaluation of non-monotonic reasoning formalisms under the name Léa Sombé, a rewriting of the French default reasoning statement '*Les A sont B*' ('the *A*s are *B*s') (Besnard et al., 1989; Besnard et al., 1990; Besnard et al., 1994). The paper *On the relation between possibilistic logic and modal logics of belief and knowledge* by Mohua Banerjee, Didier Dubois, Lluís Godo and Henri Prade is in that tradition and provides a new bridge between modal logic and possibility theory.

2.4. Reasoning about time, actions and knowledge

While the modal operators Luis investigated in the 1980s were rather abstract, he subsequently started to work on their most important applications, viz. the logical modelling of reasoning about time, actions and knowledge.

Things started with a textbook on temporal logics for program verification that Luis wrote together with Eric Audureau and Patrice Enjalbert (Audureau, Enjalbert, & Fariñas del Cerro, 1990) (*Editions Masson*), and Saïd Soulhi's PhD thesis on reasoning about knowledge and mutual knowledge (Soulhi, 1985).

The PhD thesis of Pierre Bieber (now researcher at *Office national d'Etudes et de Recherches Aérospatiales* (ONERA)) provided a first integrated account of logics of action and knowledge (precisely, a non-monotonic version: autoepistemic logic) in view of the verification of cryptographic protocols (Bieber, 1989).

The PhD thesis of Christel Seguin (now researcher at ONERA) extended the picture towards reasoning about intentions and planning (Seguin, 1992). This line of work was later taken up and applied to speech act theory in the PhD thesis of Dominique Longin, in the framework of a project with *France Télécom* on human–machine dialogue systems (Longin, 1999).

The PhD thesis of Nathalie Chetcuti-Sperandio (now *maître de conférences* at *Université d'Artois*) related the temporal reasoning line of work to proof methods by investigating tableaux for the duration calculus (Chetcuti-Sperandio, 2001).

Further work included Data Analysis Logic that Luis defined with Ewa Orlowska, which provided a link with rough set theory (Fariñas del Cerro and Orlowska, 1985).

This line of research is addressed in the present issue by several contributions from Luis's colleagues: *Dynamic Epistemic Logics: Promises, Problems, Shortcomings, and Perspectives* by Andreas Herzig; *Reasoning about Trust and Aboutness in the Context of Communication* by Robert Demolombe; *Society semantics and the logic way to collective intelligence* by Walter Carnielli and Mamede Lima-Marques and *A multimodal logic for closeness* by Alfredo Burrieza, Emilio Muñoz Velasco and Manuel Ojeda Aciego belong to this category. Moreover, if we regard *argumentation* as a discussion between agents putting forward what they believe, the contribution *Foundations for a Logic of Arguments* by Leila Agmoud, Philippe Besnard and Anthony Hunter can be included in this category.

2.5. Spatial reasoning

In parallel with his investigations on conditional reasoning and tableaux-based approaches in non-classical logics, in the early 1990s, Luis became interested in geometrical reasoning. After presenting a memorable talk on this subject to his research group, together with Philippe Balbiani, he began to investigate the possibility of defining a modal logic of space, with points and lines playing the role of possible worlds and with geometrical relationships between them playing the role of accessibility relations. Then, together with Tinko Tinchev and Dimiter Vakarelov, they produced in 1994–1997 the first modal logic of incidence geometries (Balbiani, Fariñas del Cerro, Tinchev, & Vakarelov, 1997). This modal logic has been, since that time, the starting point of several other modal logics for point-line geometry. At the same time, Luis became interested by qualitative spatial and temporal reasoning (QSTR). At that time, the investigation of QSTR amounted to research on Region Connection Calculus and Allen's calculus. Together with Philippe Balbiani and their PhD student Jean-François Condotta (PhD in 2000, now professor in Artois University), Luis developed many new qualitative frameworks for reasoning about space and time: the rectangle calculus as a two-dimensional variant of Allen's calculus, the block algebra and others. These qualitative frameworks are, by now, parts of many robot navigation systems based on QSTR (Condotta, 2000). Finally, Luis's investigations in geometrical reasoning has also given rise to a book on the mechanization of geometry *Eléments de géométrie mécanique* (Balbiani, Dugat, Fariñas del Cerro, & Lopez, 1994) written in collaboration with Philippe Balbiani, Vincent Dugat and the PhD student Anne Lopez (Lopez, 1995). Further work included the PhD thesis of Claudio Masolo (now CNR researcher at LOA-ISTC Italy) on the ontology of space and time (Masolo, 2000).

Dimiter Vakarelov's contribution to this special issue, entitled *A Mereotopology Based on Sequent Algebras*, fits into this category of Luis's research.

2.6. Computational biology

Together with Robert Demolombe, Luis worked on abduction problems in classical first-order logic, alias consequence finding, as well as on the notion of *topic* in first-order logic. They recently applied the resulting techniques to reasoning about metabolic networks, within the framework of the PhD thesis of Naji Obeid (Obeid, 2014). This line of work is currently pursued with Jean-Marc Alliot and Martín Diéguez.

A recent contribution, closely related to Luis's research on the logical modelling of biological systems, is the contribution entitled *Temporal Abductive Reasoning about Biochemical Reactions*, authored by Serenella Cerrito, Marta Cialdea and Robert Demolombe and published in this special issue.

3. Conclusions

If we had to define Luis Fariñas del Cerro within a single phrase, it would be *Logic, Leadership and Enthusiasm*. *Logic* comes from his research, which covers a wide spectrum of topics in non-classical logics resulting in many contributions that inspire new researchers nowadays. *Leadership* is due to his success in teamwork and management. Under his supervision, the IRIT was promoted to the category of reference for a research laboratory in computer science and, especially, in formal methods for Artificial Intelligence. Luis's colleagues and friends would like to express their gratitude for transmitting them his *enthusiasm* and passion for a research field that has given us so much, in great part, thanks to him.

Notes

1. Previously called ECCAI.
2. https://www.irit.fr/Lotrec.

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